

Chapter 6 Emergency Action Plans (EAP)

6-1. General

a. Definitions.

(1) Emergency - An emergency, in terms of dam operation, is defined as a condition which develops unexpectedly, endangers the structural integrity of the dam and/or downstream property and human life, and requires immediate action.

(2) EAP - An EAP is a plan of action to reduce the potential for property damage and loss of life in an area affected or about to be affected by a dam failure or large flood. It includes both the portion of a dam safety plan prepared by the Corps of Engineers and the complementary evacuation plan prepared by non-Federal interests.

b. Background. Corps of Engineers major subordinate command offices were instructed in March 1978 to begin preparation of flood EAPs for dams under their jurisdiction. Initially the effort was directed to delineate areas downstream from the dams that would be flooded in the event of dam failure. The product of these efforts was inundation area maps (ER 1130-2-419). In June 1980 the Corps of Engineers issued detailed instructions for the preparation of flood EAPs (U.S. Army Corps of Engineers, Hydrologic Engineering Center 1980, 1982). Subsequently, in August 1983, the Corps of Engineers distributed case studies of an EAP and evacuation plan to field offices (U.S. Army Corps of Engineers, Hydrologic Engineering Center 1983a, 1983b).

6-2. Scope of Emergency Action Plan

Guidance (U.S. Army Corps of Engineers, Hydrologic Engineering Center 1980) has been provided for preparation of EAPs to deal with potential emergencies caused by

a. Spillway discharges sufficiently large to cause flooding in downstream areas.

b. Flooding upstream of dams due to backwater effects or high pool levels.

c. Dam failure.

6-3. Components of Emergency Action Plan

The principal components of EAPs (including agency responsible for preparation) are as follows (U.S. Army Corps of Engineers, Hydrologic Engineering Center 1980):

a. Emergency identification subplan (Corps of Engineers). The object of this subplan is to describe procedures and means for ensuring reliable identification and evaluation of existing or potential emergencies. The major elements of the subplan are:

(1) Listing of the conditions which could indicate an existing or potential emergency.

(2) Description of the data and information collection system, monitoring arrangements, inspection procedures, and other provisions for early detection of conditions indicating an existing or potential emergency.

(3) Procedures, aids, instructions, and other provisions for interpreting information and data to assess the severity and magnitude of any existing or potential emergency.

b. Emergency operations and repair subplan (Corps of Engineers). The objectives of this subplan are to guide immediate operational decisions in the event of various types of emergencies; identify the need for equipment, material, labor, and other necessities for carrying out emergency repairs; and describe the procedures for securing and employing needed equipment, material, labor, and other necessities. The major elements of the subplan are:

(1) Identification of the appropriate response to the type and severity of existing or potential emergencies.

(2) Emergency gate operation.

(3) Reservoir dewatering plan.

(4) Description of equipment and materials to be stockpiled for use in carrying out emergency operations and repairs.

(5) Assignments of responsibilities for carrying out emergency operations and repairs.

(6) Description of needs for equipment, material, and labor not available at the site which are needed to carry out each type of emergency operation or repair.

(7) Listing of nearby contractors and other sources of needed equipment, material, and labor and description of procedures for securing their assistance on an emergency basis.

c. Notification subplan (Corps of Engineers and non-Federal). The objective of this subplan is to describe the procedures and means for prompt notification of appropriate parties concerning existing or potential emergencies. The major elements of the subplan are:

(1) Inundation maps which show the area likely to be inundated and time of onset of dangerously high flows for each emergency condition for which plans are made (Corps of Engineers).

(2) Listing of vital services and facilities outside the area of inundation which will or may be disrupted by the level of inundation associated with each emergency condition for which plans are made (non-Federal).

(3) Listing of major secondary problems resulting from the level of inundation associated with each emergency condition for which plans are made (non-Federal):

(4) Evacuation maps which show (non-Federal):

(a) All areas which should be evacuated because of inundation, secondary problems, loss of services, isolation, or other reasons which are associated with each emergency condition for which plans are made.

(b) Major evacuation routes.

(c) Areas requiring priority in evacuation.

(d) Potential obstacles to timely evacuation.

(5) Listing of persons to be notified about each emergency condition for which plans are made and procedures for notification including description of primary and secondary means of communication to be used, listing of telephone numbers and addresses, and other information needed for reliable and prompt contact for (Corps of Engineers):

(a) Notifications internal to the Corps.

(b) Notifications from the Corps to principal local officials.

(c) Notifications from the Corps to other Federal officials.

(d) Distribution of warnings from the Corps to officials responsible for dissemination to the general public.

(e) Dissemination of warnings by the Corps directly to the general public in the immediate vicinity of the dam and reservoir.

(6) Example press releases for each emergency condition for which a plan is prepared and instructions for adaptation before their use to the specifics of an emergency situation including but not limited to (Corps of Engineers):

(a) Exact nature of emergency and degree of danger.

(b) Remedial action under way.

(c) Expected course of events and timing.

(d) Appropriate action for public to take.

(7) Description of the procedure and means for dissemination of warnings directly to the general public in the immediate vicinity of the dam and reservoir (Corps of Engineers).

d. *Evacuation subplan (non-Federal)*. Non-Federal officials are to be encouraged to develop evacuation subplans as a complement to the portion of dam emergency plans prepared by the Corps. The objectives of the evacuation subplan are to provide for the timely and safe evacuation of threatened areas and the minimization of property damage. The major elements of the subplan are:

- (1) Description of traffic control arrangements to expedite evacuation and passage of emergency vehicles and prevent accidental travel into dangerous areas.
- (2) Provisions for any necessary assistance to evacuees such as transportation and aid to invalids.
- (3) Arrangements for sheltering, feeding, and other care of evacuees.
- (4) Description of actions to be taken to reduce damages and other losses.
- (5) Arrangements for security of evacuated areas.
- (6) Arrangements addressing other aspects as required for the case at hand.

6-4. Number of Emergency Action Plans Required

A large number of hypothetical emergencies could be conceived by combining various causes for and assumptions about emergencies of one type or another. It is obviously impractical to prepare completely separate plans to address each potential emergency condition which might be postulated. Instead, each major portion of the emergency plan must be considered individually with respect to how many separate versions are necessary (U.S. Army Corps of Engineers, Hydrologic Engineering Center 1980):

a. *Emergency identification subplan (Corps of Engineers)*. Only one emergency identification subplan is required.

b. *Emergency operations and repair subplan (Corps of Engineers)*. The emergency operations and repair subplan consists of guidance and procedures for dealing with a variety of emergencies. One subplan is sufficient. The portion of its contents dealing with emergency responses should be divided according to the type of emergency addressed or action to be taken as, for example, the following:

- (1) Wave erosion.
- (2) Excess seepage.
- (3) Piping.
- (4) High pool conditions.
- (5) Malfunction of control gates.
- (6) Failure of discharge facilities.
- (7) Upstream dam failure.
- (8) Downstream dam failure.

c. *Notification subplan (Corps of Engineers and non-Federal)*. Notification subplans are to be prepared for three basic emergency conditions including: spillway design discharge without failure, spillway design discharge with failure, and failure at normal high pool level (top of flood control pool). Separate notification subplans are required for each emergency condition because:

- (1) Identification of the local officials to be notified of an existing or potential emergency depends on the area requiring evacuation which is associated with each emergency condition.
- (2) The need to notify other Federal agencies, the public in the immediate vicinity of the dam and reservoir, and other parties varies according to the nature of the existing or potential emergency.
- (3) The appropriate text of news releases depends on the emergency condition for which they are prepared.

d. Evacuation subplan (non-Federal).
Evacuation subplans will be prepared for conditions of:

- (1) Spillway design flood.
- (2) Spillway design flood with dam failure.
- (3) Dam failure with normal high pool level (top of flood control pool).

6-5. Emergency Action Plan Exercises

a. General. Testing of the EAP involving all participants is necessary to ensure that the plan is up-to-date and workable in practice under real-life conditions (Basinger 1990, Mahoney 1990, Gotzmer 1991).

b. Corps of Engineers requirements. ER 1130-2-419 states:

Division Commanders are directed to implement a dam safety training program for O&M personnel, with retraining every four years...Upon completion of initial safety training sessions for each project, operational training exercises for emergency situations shall be developed. These exercises shall be based on the more probable emergency situations that might occur on each major dam feature. A record shall be maintained at the project showing date, subject material, and personnel involved for each exercise conducted.

According to the "Emergency Action Planning Guidelines for Dams" developed by the Interagency Committee on Dam Safety and adopted by the Corps of Engineers (Federal Emergency Management Agency 1985, 1990b):

The dam owner should prepare scenarios for slowly developing, rapidly developing, and instantaneous emergencies and test the state of training and readiness of key personnel responsible for actions during an emergency to assure that they know and understand the procedures to be followed

and actions required. Any special procedures required for nighttime, weekends, and holidays should also be included. The tests should include a drill simulating emergency condition. Coordination and consultation with local government, law enforcement officials, and other organizations involved is desirable in order to enhance the realism of the test. Their involvement will perfect the close coordination with agencies necessary for a successful execution of the plan in an actual emergency. The test should be critiqued in writing and the plan should be revised to correct any deficiencies noted.

c. Types of exercises. FEMA has identified five types of exercises that constitute an exercise program, with each one building on the concepts of the previous exercise. These five types of exercises are (Federal Energy Regulatory Commission 1991; Federal Emergency Management Agency 1989a, 1989b; Gotzmer 1991):

(1) Orientation seminar. This involves bringing together persons with a role or interest in the EAP for discussion and to initiate plans for the annual drill or more in-depth exercise, and to become familiar with the roles, procedures, and responsibilities of those involved.

(2) Drill. A drill is the lowest level exercise. A drill test develops or maintains skills in a single emergency response procedure. The in-house drill tests the state of training and readiness of key personnel to ensure that they are fully cognizant of the procedures and actions required during an emergency. The drill should simulate an emergency condition at the dam under which the EAP would be implemented. Special procedures required for nighttime, weekends, and holidays should also be considered when developing the scenario. Testing of remote sensing instrumentation should be included. Coordination with local government, law enforcement officials, and other organizations involved is desirable. This will enhance the realism of the drill and ensure the accuracy of telephone numbers of persons to be notified. While a planned drill will allow persons involved to rehearse their roles, a surprise drill can be more educational and expose flaws in the EAP. Immediately following the

drill the responses to the emergency scenario at all levels will be reviewed and a critique prepared. The purpose of the critique is to identify lessons learned and deficiencies in the EAP including notification, priorities, and responsibilities assigned.

(3) Tabletop exercise. The tabletop exercise involves low stress, little attention to real-time, lower level of preparatory effort, and only rough attempts to simulate actual conditions. The tabletop exercise is conducted once a year. The focus is on training and familiarization with roles, procedures, responsibilities, and personalities of the persons involved. The tabletop exercise consists of discussion in a meeting format through one or more facilitators. The facilitator leads the conduct of the tabletop exercise and makes sure every participant responds to at least one message (described below) during the exercise. Effectiveness is determined by the impact of feedback from the participants on evaluating and revising policies, plans, and procedures. There is no deployment of resources or utilization of equipment. A narrative (or scenario) sets the scene for the simulated event by briefly describing what has happened and what is known up to the time of the exercise. The participants are provided with messages as the exercise progresses. The purpose of the messages is to provide updated information to the participants so that they will respond with an action or a decision. Once the exercise is completed, the results will be evaluated. An immediate post-exercise critique should be held followed by an evaluation report. The critique will be both oral and written and will provide the participants with a forum to gather and share information about what happened during the exercise, to describe what went right, and to identify what went wrong. The formal evaluation of the exercise consists of a written report based on observations and recommendations that come out of the critique, as well as the report(s) of the facilitator(s). Follow-up (the process of implementing the recommendations) is the final and critical stage of the exercise process. The advantage of a tabletop exercise is the modest commitment of time, cost, and resources. It provides an effective method of reviewing plans and implementing procedures and policies, and provides an opportunity for key personnel to become acquainted and review emergency responsibilities and procedures. The disadvantages of a tabletop exercise are that the

tabletop lacks realism and does not provide a true test of participants' capabilities.

(4) Functional exercise. The functional exercise is the highest level test that does not involve full activation of field personnel and facilities. The functional exercise is conducted once every 4 years. The functional exercise tests capabilities of the participants under a stress-induced environment with time constraints. Whereas a tabletop exercise provides opportunities throughout the exercise to stop and discuss actions and responses, the functional exercise is a time constrained test with limited opportunity for discussion. The functional exercise simulates actual emergency situations and responses of the participants without actual field deployment. The exercise is conducted with the participants co-located or located at their own facilities, with communications through expected emergency communication links. The functional exercise is based on a simulation of an emergency including a description of the situation, a master sequence of events list, a timed sequence of messages, and communication between participants and simulators. There are five functions or capabilities which should be included in a functional exercise:

(a) Alert, notification, and warning. This function tests the communication system and the messages to determine if they are appropriate and clearly understood. It verifies names and phone numbers on the notification list. Remote sensing equipment should be tested at the start of the exercise.

(b) Direction and control function. This function tests and evaluates the emergency operations capability and timely response. It includes the response to health problems, fire, downed power lines, and loss of life, including drownings.

(c) Evacuation. This capability is a key issue in the exercise as it tests the participants' understanding of the inundation maps. Experience indicates the inundation boundaries and the road names may not always be clear and fully understood (for example, road names used by local officials are often different from those on Geological Survey maps or state route maps). Maps are often revised as a result of this information.

(d) Shelters. This function reveals those shelters that should not be used because they are in the flood plain.

(e) Public information. This function tests the capability to issue accurate information during a dam failure event. Activation of the emergency operations center at the state or local level, as appropriate, should be encouraged. Apart from the actual participants in the functional exercise there are the exercise controller, exercise simulators, and exercise evaluators. The controller monitors the sequence of events as they unfold, the flow of messages, and the overall conduct of the exercise. The simulators send prescribed messages at the scheduled time, respond to unanticipated actions by participants with spontaneous messages, and maintain contact with the controller during the exercise. The evaluators observe the actions and decisions of the participants during the exercise and contribute, along with the exercise participants, to writing the evaluation report. As with the tabletop exercise, the critique, the evaluation report, and the follow-up to the recommendations in the report are important aspects of the functional exercise.

(5) Full-scale exercise. The full-scale exercise is the most comprehensive test and is intended to evaluate the operational capability of the emergency management system in a stress environment with mobilization of emergency workers, equipment, and

resources to demonstrate coordination and response capability. Full-scale exercises draw media and community attention to emergency preparedness; teach by doing; test total coordination, not only among policy and coordination officials, but also field forces; and point out physical resource capabilities and/or limitations. For agencies or local communities, full-scale exercises require considerable preparation and provide practical tests of "first-in" responders, including police, fire, and medical personnel. They test triage (allocation of treatment to disaster victims to maximize the number of survivors) procedures, on-scene management of resources, and coordination and communication through field command posts. As with the functional exercise, the controller is responsible for ensuring that the exercise starts on schedule. Simulators and evaluators keep a log of all significant events. During a full-scale exercise at Garrison Dam, North Dakota, conducted in August 1987, personnel were stationed at several locations in the District Office and at Garrison Dam to monitor and document phone and radio communications, decision making, and repair efforts (U.S. Army Engineer District, Omaha 1987). Each participant should log his actions as much as possible. Videotaping the exercise and critique is beneficial. The media should be included in any exercise plan to increase realism. At the conclusion of the full-scale exercise, the critique and evaluation report are important so that necessary follow-up action can be taken.